

WHAT IS CLAIMED IS:

1. A roll for use in manufacturing metal plate, strip, sheet, or foil, comprising:
a cylindrical roll core having a central longitudinal axis and defining a plurality of longitudinally extending cooling passages for conducting a cooling medium through the roll core to cool the roll during use; and
at least one metal overlay formed on the roll core.
2. The roll of claim 1 wherein the cooling passages are located proximate to the surface of the roll core.
3. The roll of claim 1 wherein the cooling passages are located proximate to the surface of the roll core and are spaced regularly about the central longitudinal axis of the roll core.
4. The roll of claim 1 wherein the roll core comprises a cylindrical roll body and two outward extending axles, and wherein the at least one metal overlay is formed on the roll body:
5. The roll of claim 4 wherein the cooling passages are located proximate to the surface of the roll body.
6. The roll of claim 4 wherein the cooling passages are located proximate to the surface of the roll body and extend substantially the entire length of the roll body.
7. The roll of claim 4 wherein the cooling passages are located proximate to the surface of the roll body and are spaced regularly about the central longitudinal axis of the roll body.
8. The roll of claim 1 wherein the roll core further comprises:
at least one centrally located inlet passage; and
a plurality of radially extending passages extending from the at least one inlet passage to the cooling passages for conducting the cooling medium from the at least one inlet passage to the cooling passages.

9. The roll of claim 8 wherein the at least one inlet passage extends substantially parallel to the central longitudinal axis of the roll core and the radial passages extend substantially perpendicular to the at least one inlet passage.

10. The roll of claim 8 wherein the at least one inlet passage extends substantially parallel to the central longitudinal axis of the roll core and the radial passages each define an acute angle with the central longitudinal axis.

11. The roll of claim 1 wherein the roll core further comprises:
at least one centrally located inlet passage;
at least one centrally located outlet passage;
a first plurality of radially extending passages extending from the at least one inlet passage to the cooling passages for conducting the cooling medium to the cooling passages; and
a second plurality of radially extending passages extending from the cooling passages to the at least one outlet passage for conducting the cooling medium from the cooling passages to the at least one outlet passage.

12. The roll of claim 11 wherein the at least one inlet passage and at least one outlet passage extend substantially parallel to the central longitudinal axis of the roll core and the first and second plurality of radial passages extend substantially perpendicular to the at least one inlet passage and at least one outlet passage.

13. The roll of claim 11 wherein the at least one inlet passage and at least one outlet passage extend substantially parallel to the central longitudinal axis of the roll core and the first and second plurality of radial passages each define an acute angle with the central longitudinal axis.

14. The roll of claim 11 wherein the roll core comprises a cylindrical roll body and two outward extending axles, and wherein the at least one inlet passage and at least one outlet passage extend from one of the axles through the roll body and at least partially through the second axle.

15. The roll of claim 11 wherein the roll core comprises a cylindrical roll body and the cooling passages extend the entire length of roll body, the roll further comprising end caps attached, respectively, to opposite ends of the roll body for closing the ends of the cooling passages.

16. A roll for use in manufacturing metal plate, strip, sheet, or foil, comprising:
a cylindrical roll core having a central longitudinal axis; and
a metal overlay formed on the roll core, the metal overlay defining a plurality of cooling passages for conducting a cooling medium through the metal overlay to cool the roll during use.

17. The roll of claim 16 wherein the cooling passages extend substantially parallel to the central longitudinal axis of the roll core.

18. The roll of claim 16 wherein the cooling passages extend longitudinally substantially the entire length of the metal overlay.

19. The roll of claim 16 wherein the cooling passages are spaced regularly about the central longitudinal axis of the roll core.

20. The roll of claim 16 wherein the roll core comprises a cylindrical roll body and two outward extending axles, and wherein the metal overlay is formed on the roll body.

21. The roll of claim 20 wherein the cooling passages extend substantially the entire length of the roll body.

22. The roll of claim 20 wherein the cooling passages are spaced regularly about the central longitudinal axis of the roll core.

23. The roll of claim 16 wherein the roll core further comprises:
at least one centrally located inlet passage; and
a plurality of radially extending passages extending from the at least one inlet passage to the cooling passages for conducting the cooling medium from the at least one inlet passage to the cooling passages.

24. The roll of claim 23 wherein the at least one inlet passage extends substantially parallel to the central longitudinal axis of the roll core and the radial passages extend substantially perpendicular to the at least one inlet passage.

25. The roll of claim 23 wherein the at least one inlet passage extends substantially parallel to the central longitudinal axis of the roll core and the radial passages each define an acute angle with the central longitudinal axis.

26. The roll of claim 16 wherein the roll core further comprises:
at least one centrally located inlet passage;
at least one centrally located outlet passage;
a first plurality of radially extending passages extending from the at least one inlet passage to the cooling passages for conducting the cooling medium to the cooling passages; and
a second plurality of radially extending passages extending from the cooling passages to the at least one outlet passage for conducting the cooling medium from the cooling passages to the at least one outlet passage.

27. The roll of claim 26 wherein the at least one inlet passage and at least one outlet passage extend substantially parallel to the central longitudinal axis of the roll core and the first and second plurality of radial passages extend substantially perpendicular to the at least one inlet passage and at least one outlet passage.

28. The roll of claim 26 wherein the at least one inlet passage and at least one outlet passage extend substantially parallel to the central longitudinal axis of the roll core and the first and second plurality of radial passages each define an acute angle with the central longitudinal axis.

29. The roll of claim 26 wherein the roll core comprises a cylindrical roll body and two outward extending axles, and wherein the at least one inlet passage and at least one outlet passage extend from one of the axles through the roll body and at least partially through the second axle.

30. The roll of claim 16 wherein the roll core comprises a cylindrical roll body and the cooling passages extend the entire length of the metal overlay, the roll further comprising end caps attached, respectively, to opposite ends of the roll body for closing the ends of the cooling passages.

31. A roll for use in manufacturing metal plate, strip, sheet, or foil comprising:
a cylindrical roll core having a central longitudinal axis;
a first metal overlay formed on the roll core, the first metal overlay defining a plurality of cooling passages for conducting a cooling medium through the first metal overlay to cool the roll during use; and
at least one additional metal overlay formed on the first metal overlay.

32. The roll of claim 31 wherein the first metal overlay has a hardness lower than the hardness of the at least one additional metal overlay.

33. The roll of claim 31 wherein the cooling passages extend substantially parallel to the central longitudinal axis of the roll core.

34. The roll of claim 31 wherein the cooling passages extend substantially the entire length of the first metal overlay.

35. The roll of claim 31 wherein the cooling passages are spaced regularly about the central longitudinal axis of the roll core.

36. The roll of claim 31 wherein the roll comprises a cylindrical roll body and two outward extending axles, and wherein the first metal overlay and the at least one additional metal overlay are formed on the roll body.

37. The roll of claim 36 wherein the cooling passages extend substantially the entire length of the roll body.

38. The roll of claim 36 wherein the cooling passages are spaced regularly about the central longitudinal axis of the roll core.

39. The roll of claim 31 wherein the roll core further comprises:
at least one centrally located inlet passage; and
a plurality of radially extending passages extending from the at least one inlet passage to the cooling passages for conducting the cooling medium from the at least one inlet passage to the cooling passages.

40. The roll of claim 39 wherein the at least one inlet passage extends substantially parallel to the central longitudinal axis of the roll core and the radial passages extend substantially perpendicular to the at least one inlet passage.

41. The roll of claim 39 wherein the at least one inlet passage extends substantially parallel to the central longitudinal axis of the roll core and the radial passages each define an acute angle with the central longitudinal axis.

42. The roll of claim 31 wherein the roll core further comprises:
at least one centrally located inlet passage;
at least one centrally located outlet passage;
a first plurality of radially extending passages extending from the at least one inlet passage to the cooling passages for conducting the cooling medium to the cooling passages; and
a second plurality of radially extending passages extending from the cooling passages to the at least one outlet passage for conducting the cooling medium from the cooling passages to the at least one outlet passage.

43. The roll of claim 42 wherein the at least one inlet passage and at least one outlet passage extend substantially parallel to the central longitudinal axis of the roll core and the first and second plurality of radial passages extend substantially perpendicular to the at least one inlet passage and at least one outlet passage.

44. The roll of claim 42 wherein the at least one inlet passage and at least one outlet passage extend substantially parallel to the central longitudinal axis of the roll core and the first and second plurality of radial passages each define an acute angle with the central longitudinal axis.

45. The roll of claim 42 wherein the roll core comprises a cylindrical roll body and two outward extending axles, and wherein the at least one inlet passage and at least one outlet passage extend from one of the axles through the roll body and at least partially through the second axle.

46. The roll of claim 42 wherein the roll core comprises a cylindrical roll body and the cooling passages extend the entire length of the first metal overlay, the roll further comprising end caps attached, respectively, to opposite ends of the roll body for closing the ends of the cooling passages in the first metal overlay.

47. The roll of claim 31 wherein the first metal overlay and the at least one additional metal overlay are each formed to a thickness of up to 6 inches.

48. The roll of claim 31 wherein the first metal overlay is a thermally conductive metal selected from the group consisting of copper, bronze, steel, and stainless steel.

49. The roll of claim 31 wherein the at least one additional metal overlay is selected from the group consisting of steel and nickel, cobalt, copper, and titanium based alloys.

50. The roll of claim 31 wherein the at least one additional metal overlay comprises a single metal overlay formed on the first metal overlay, the single metal overlay selected from the group consisting of steel and nickel, cobalt, copper, and titanium based alloys.